

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method, ~~comprising: for generating a quantitative face direction from a single digital image of a person's face, said method including the steps of:~~
computing ~~at~~ the rotation of a face in said ~~using a single digital image using by~~
determining a nose axis of said face;
computing ~~at~~ the tilt of said face in said ~~using the single digital image; and~~
determining said ~~a~~ quantitative face direction of said face in said image using the
computed rotation and computed tilt of said face.
2. (Currently amended) The method according to claim 1, ~~further including the step of wherein determining said nose axis by~~ comprises maximizing a correlation measure between a left side and a right side of said face from left and right sub-images of said image.
3. (Currently amended) The method according to claim 2, wherein ~~said nose axis determining said nose axis step further comprises~~ includes the step of comparing one of said left and right sides with a synthetic side derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.
4. (Currently amended) The method according to claim 3, wherein ~~said nose axis determining said nose axis further comprises~~ applying ~~step applies~~ a contrast enhancement

algorithm to a nose region of said image, wherein said nose is the part of a face that reflects the most light, said reflected light being represented as a line-like region close to a real nose axis.

5. (Currently amended) An apparatus, ~~comprising: for generating a quantitative face direction from a single digital image of a person's face, said apparatus including:~~

means for computing ~~the~~ rotation of a face in said a single digital image using a nose axis of said face;

means for computing ~~the~~ tilt of said face in said image; and

means for determining said ~~a~~ quantitative face direction of said face in said image using the computed rotation and computed tilt of said face.

6. (Original) The apparatus according to claim 5, further including means for determining said nose axis by maximizing a correlation measure between a left side and a right side of said face from left and right sub-images of said image.

7. (Currently amended) The apparatus according to claim 6, wherein said ~~nose axis determining means~~ means for determining said nose axis further includes means for comparing one of said left and right sides with a synthetic side derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.

8. (Currently amended) The apparatus of claim 7, wherein said ~~nose axis determining means~~ means for determining said nose axis applies a contrast enhancement

algorithm to a nose region of said image, wherein said nose is the part of a face that reflects the most light, said reflected light being represented as a line-like region close to a real nose axis.

9. (Currently amended) A computer program product having a computer usable medium having a computer readable program code means embodied therein for generating a quantitative face direction from a single digital image of a person's face, said computer program product including:

computer readable program code means for computing ~~the~~ rotation of a face in said image using a nose axis of said face;

computer readable program code means for computing ~~the~~ tilt of said face in said image;
and

computer readable program code means for determining said quantitative face direction of said face in said image using the computed rotation and computed tilt of said face.

10. (Original) The computer program product according to claim 9, further including computer readable program code means for determining said nose axis by maximizing a correlation measure between a left side and a right side of said face from left and right sub-images of said image.

11. (Original) The computer program product according to claim 10, wherein said computer readable program code means for determining said nose-axis further includes computer readable program code means for comparing one of said left and right sides with a synthetic side

derived from the other of said left and right sides using symmetry and a perspective transformation of said other side to compute said correlation measure.

12.-45. (Canceled).

46. (New) The method of claim 1 further comprising:
determining changes in face direction using a plurality of quantitative face
directions;
applying labels to said changes; and
parsing a sequence of said labels to determine a facial gesture.

47. (New) The method of claim 46 further comprising generating the plurality of
quantitative face directions by obtaining a plurality of digital images of a face and, for each
digital image, computing the rotation of the face, computing the tilt of the face, and determining
the quantitative face direction using the computed rotation and computed tilt of the face.

48. (New) The method of claim 1 further comprising providing a visual mouse to
detect said quantitative face direction as an interface for a computer application.

49. (New) The method of claim 1 further comprising providing said quantitative face
direction as input to a computer application to provide eye-to-eye contact communication in
video-conferencing.

50. (New) The apparatus of claim 5 further comprising:
means for determining changes in face direction using a plurality of
quantitative face directions;
means for applying labels to said changes; and
means for parsing a sequence of said labels to determine a facial gesture.

51. (New) The method of claim 50 further comprising means for generating the plurality of quantitative face directions by obtaining a plurality of digital images of a face and, for each digital image, computing the rotation of the face, computing the tilt of the face, and determining the quantitative face direction using the computed rotation and computed tilt of the face.

52. (New) The apparatus of claim 5 further comprising means for providing a visual mouse to detect the quantitative face direction as an interface for a computer application.

53. (New) The apparatus of claim 5 further comprising means for providing said face direction as input to a computer application to provide eye-to-eye contact communication in video-conferencing.

54. (New) The computer program product of claim 9 further comprising:
computer readable program code means for determining face direction
changes using a plurality of quantitative face directions;
computer readable program code means for applying labels to said
changes; and
computer readable program code means for parsing a sequence of said labels to
determine a facial gesture.

55. (New) The method of claim 54 further comprising computer readable program code means for generating the plurality of quantitative face directions by obtaining a plurality of digital images of a face and, for each digital image, computing the rotation of the face, computing the tilt of the face, and determining the quantitative face direction using the computed rotation and computed tilt of the face.

56. (New) The computer program product of claim 9 further comprising computer readable program code means for providing a visual mouse to detect the quantitative face direction as an interface for a computer application.

57. (New) The computer program product of claim 9 further comprising computer readable program code means for providing said face direction as input to a computer application to provide eye-to-eye contact communication in video-conferencing.